

NASA's Terrestrial Ecology Program recently announced that it is funding two studies intended "...to identify the scientific questions and develop the initial study design and implementation concept for a new NASA Terrestrial Ecology field campaign or related team project." One of these studies is focused on high northern latitude ecosystems:

***Vulnerability and Resiliency of Arctic and Sub-Arctic Landscapes (VuRSAL) –
The Role of Interactions between Climate, Permafrost, Hydrology, and Disturbance in Driving
Ecosystem Processes***

This scoping study will focus on processes and feedbacks occurring at landscape and regional scales in biomes experiencing significant climate change, particularly over the past half century, that have caused or are causing rapid changes to landforms, ecosystems, and ecosystem processes in the High Northern Latitudes. The first goal of this scoping study will be on identifying scientific issues and questions and underlying rationale in two specific areas: (a) interactions between climate, permafrost, hydrology and disturbance controls on the vulnerability and resilience of arctic and sub-arctic ecosystems (i.e., what processes are driving ecosystem changes?); and (b) the resulting impacts these interactions have on ecosystem processes and feedbacks to climate and the major forcing processes.

Over the past decade, researchers, land managers, policy makers and the general public have all recognized that climate warming has had and will continue to have major impacts in arctic and sub-arctic regions. As a result, a number of assessment and planning activities have occurred that not only identified the major climate impacts in this region, but in many cases have resulted in the development of plans for dealing with these impacts. In addition, there are a number of ongoing and planned research activities already in place in both Canada and Alaska that are studying the impacts of climate change in this region. *These ongoing activities provide the foundation upon which this scoping study will be built.*

The second goal of this scoping study will be to put forward a coordinated plan to carry out the research needed to develop new knowledge required to monitor, assess, and forecast the impacts of climate change in this region. In particular the second goal will be to develop a plan for a research program to address the identified questions and issues in order to: (1) better understand how the terrestrial ecosystems in sub-arctic and arctic landscapes are presently changing, (2) define and quantify feedbacks between the land surface, the atmosphere, and the primary processes that are driving ecosystem changes; and (3) improve predictions of how the ecosystems will change in the future. Figure 1 outlines the major focus area/themes that will be explored during this scoping study.

The scoping study plan will focus on a future field experiment or campaign, and will identify the required observational (e.g., spaceborne, airborne, and/or supporting in situ observations) and analytical (e.g., models, data, and information systems) infrastructure to address the issues and questions. This plan is not meant to supersede or replace existing and/or planned research efforts, but is intended to provide the opportunity to coordinate these efforts, and to identify areas where additional resources are required to address the broad array of issues and questions that will be considered as part of the scoping study. In particular, NASA's interest in this scoping study is on conducting research on the use of satellite and airborne remote sensing data, such as that carried out during past field campaigns sponsored by NASA's Terrestrial Ecology Program. *Participation by scientists and program managers involved in ongoing or planned monitoring*

and research activities that are related to the issues and questions being addressed is both welcome and encouraged.

The research conducted during previous NASA-sponsored field campaigns was greatly facilitated through the development of systems to archive data generated during the campaign in order to increase accessibility in a timely manner. While it is envisioned that a similar information system will be part of the proposed field campaign, there is also the need to design and develop a system that considers the needs of users beyond supporting research alone. In particular, recent recommendations from the U.S. Climate Change Science Program and the NRC report ***Restructuring Federal Climate Research to Meet the Challenges of Climate Change*** both recognize the need: (1) for a wide range of land surface remotely-sensed data as part of a national/international climate observing system; and (2) to provide climate information, tools, and forecasts to decision makers and stakeholders. This latter requirement has been recognized by NASA and other federal agencies involved in climate change research, and has resulted in research directed towards development of decision support systems that are linked to the data information systems that archive satellite and field-based information products as well as the results from modeling activities. As part of this scoping effort, recommendations for the development of a broadly based information system that provides for the needs of both researchers and decision support will also be developed (Figure 2).

The goals of the scoping study will initially be addressed by a workshop at the University of Alaska in Fairbanks with participants including researchers and land managers. The objectives of this workshop will be to: (1) Discuss the current state of the science in terms of vulnerability and resiliency of arctic and sub-arctic ecosystems to climate change; (2) Identify the science issues and questions that need to be addressed; (3) Identify areas of research with potential for major, significant scientific advancement; (4) Identify the disciplinary skills needed to conduct studies designed to carry out the identified areas of research; (5) Define the central, critical role of satellite remote sensing with respect to addressing the scientific issues; and (6) Make recommendations for specific interagency, interdisciplinary field studies that would address key science issues and questions that would involve the use of NASA and other remote sensing assets. This workshop is presently scheduled for 10-13 August 2009 at the International Arctic Research Center, which is located on the campus of the University of Alaska, Fairbanks, Alaska. The outcome of this activity will include a report based on the findings of the workshop that will present a plan for an inter-agency field campaign to advance understanding of the vulnerability and future response of northern ecosystems to climate change. Because of its focus on high northern latitude regions, the targeted geographic focus of the scoping study will include Alaska and northwestern Canada. Scientists from the U.S., Canada and other countries who are carrying out research in this region are encouraged to participate in this scoping study. The report generated from the findings of the workshop will be reviewed not only by workshop attendees, but will also be open to comments and suggestions from the broader scientific community.

This effort is being organized by Eric Kasischke (University of Maryland – ekasisch@umd.edu), Scott Goetz (Woods Hole Research Center – sgoetz@whrc.com), John Kimball (University of Montana – johnk@ntsg@umt.edu), and Michelle Mack (University of Florida – mcmack@ufl.edu). Collaborators on this project who will be actively involved in planning of the workshop and development of the plan include Jennifer Harden (USGS), Larry Hinzman and Masami Fukuda (International Arctic Research Center), and Roger Ruess and Scott Rupp (University of Alaska).

There are several different ways for interested parties to participate in this scoping study:

1. Provide suggestions for the themes, issues, and/or questions that will be discussed during the workshop that will be conducted as part of this effort.
2. Participate in the workshop.
3. Provide a review of the report generated from the results of the workshop.

If you are interested in participating in any of these three activities, please contact: Eric Kasischke at ekasisch@umd.edu. Also, please feel free to contact any of the organizers to discuss this activity.

Figure 1. The scoping study will focus on understanding the direct and indirect effects of climate change on ecosystem processes in arctic and sub-arctic regions, and the feedbacks to climate and the primary forcing processes that are driving ecosystem change.

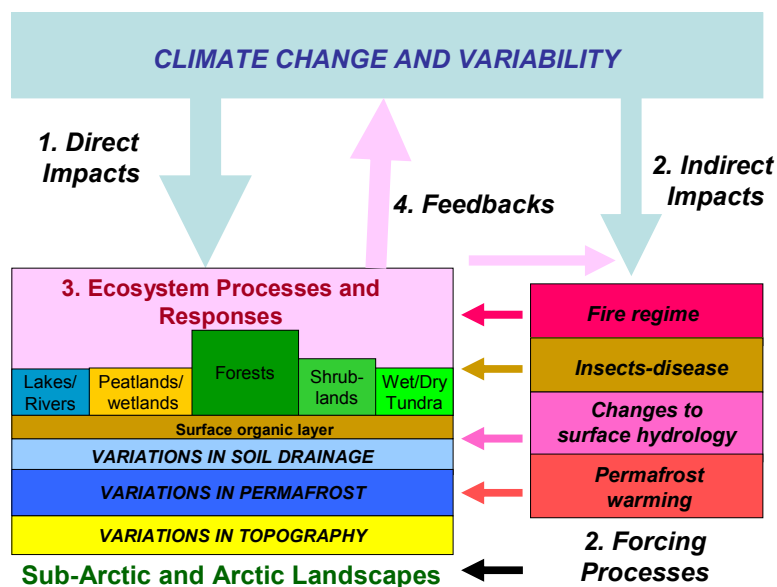


Figure 2. One of the primary goals of the scoping study will be to conduct research to develop the knowledge required for improved monitoring, assessment, and forecasting the impacts of climate change on land-surface processes in arctic and sub-arctic regions.

